



Quantitative microbial risk assessment for *Escherichia coli* O157 on lettuce, based on survival data from controlled studies in a climate chamber

Author(s): Ottoson JR, Nyberg K, Lindqvist R, Albiñ A
Year: 2011
Journal: Journal of Food Protection. 74 (12): 2000-2007

Abstract:

The aims of the study were to determine the survival of *Escherichia coli* O157 on lettuce as a function of temperature and light intensity, and to use that information in a screening-level quantitative microbial risk assessment (QMRA) in order to evaluate risk-reducing strategies including irrigation water quality guidelines, rinsing, and holding time between last irrigation and harvest. Iceberg lettuce was grown in a climate chamber and inoculated with *E. coli* O157. Bacterial numbers were determined with the standard plate count method after inoculation and 1, 2, 4, and 7 day(s) postinoculation. The experiments were carried out at 11, 18, and 25 degrees C in light intensities of 0, 400, and 600 mmol (m²)(-1) s(-1). There was a significant effect of temperature and light intensity on survival, with less bacteria isolated from lettuce incubated at 25 and 18 degrees C compared with 11 degrees C ($P < 0.0001$), and in light intensities of 400 and 600 mmol (m²)(-1) s(-1) compared with 0 mmol (m²)(-1) s(-1) ($P < 0.001$). The average log reductions after 1, 2, 4, and 7 day(s) were 1.14, 1.71, 2.04, and 3.0, respectively. The QMRA compared the relative risk with lettuce consumption from 20 scenarios. A stricter water quality guideline gave a mean fivefold risk reduction. Holding times of 1, 2, 4, and 7 day(s) reduced the risk 3, 8, 8, and 18 times, respectively, compared with harvest the same day as the last irrigation. Finally, rinsing lettuce for 15 s in cold tap water prior to consumption gave a sixfold risk reduction compared with eating unrinsed lettuce. Sensitivity analyses indicated that variation in bacterial inactivation had the most significant effect on the risk outcome. A QMRA determining the relative risks between scenarios reduces uncertainty and can provide risk managers with decision support.

Source: <http://dx.doi.org/10.4315/0362-028X.JFP-10-563>

Resource Description

Communication: ☒

resource focus on research or methods on how to communicate or frame issues on climate change;
 surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience: ☒

audience to whom the resource is directed

Policymaker

Climate Change and Human Health Literature Portal

Other Communication Audience: Risk managers

Exposure : ☒

weather or climate related pathway by which climate change affects health

Food/Water Quality, Food/Water Quality, Temperature

Food/Water Quality: Pathogen, Pathogen

Geographic Feature: ☒

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☒

resource focuses on specific location

Global or Unspecified

Health Impact: ☒

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease: E. coli

Intervention: ☒

strategy to prepare for or reduce the impact of climate change on health

A focus of content

Mitigation/Adaptation: ☒

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type: ☒

format or standard characteristic of resource

Research Article

Timescale: ☒

time period studied

Time Scale Unspecified